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Expert Performance in Information Systems

Darshana Sedera
Queensland University of Technology, d.sedera@qut.edu.au

Sharmistha Dey
Queensland University of Technology, s.dey@qut.edu.au

EXPERT PERFORMANCE IN INFORMATION SYSTEMS

Performance experte en systèmes d'information

Completed Research Paper

Darshana Sedera
Queensland University of Technology
2 George Street, Brisbane, Australia
d.sedera@qut.edu.au

Sharmistha Dey
Queensland University of Technology
2 George Street, Brisbane, Australia
s.dey@qut.edu.au

Abstract

Contrary to the common belief that expert performance is a reflection of innate abilities and capacities, this research demonstrates that expert performance in Information Systems is predominantly mediated by acquired complex skills, expertise, knowledge capabilities and experience. Analyzing data from 310 respondents representing 27 organizations, this study proposes two types of knowledge that is necessary and essential to attain expert performance in Information Systems. The relationships between the years of experience, the impact of deliberate learning of skills with expert performance are also being investigated. The study derives a classification of the 'degree of proficiency' for Information System key-user-groups that spans on a three-level continuum which has both practical and academic value. The study analysis of the degree of proficiency provides empirical evidence on the potential and limits of environmental adaptation and learning.

Résumé

Contrairement à la croyance générale que la performance experte est le reflet de capacités innées, cette recherche démontre que la performance experte est avant tout médiatisée par les compétences complexes acquises, le niveau d'expertise, la capacité de connaissance et l'expérience. Fruit de l'analyse de 310 réponses représentant 27 organisations, cette étude propose deux types de connaissances nécessaires pour atteindre la performance experte en Système d'information. La relation entre les années d'expérience ainsi que l'impact de l'apprentissage délibéré de compétences en performances expertes sont également étudiées. Cette étude démontre un continuum à 3 niveaux vers un 'degré de compétences' dans l'étude de Systèmes d'information qui apporte une valeur à la fois pratique et académique.

Keywords: Expert performance, degree of proficiency, stakeholders, training, knowledge, Path analysis, PLS

Introduction

Contrary to the common belief that expert performance is a reflection of ones' innate abilities and capacities, research in different domains of expertise has shown that expert performance is predominantly mediated by acquired complex skills, expertise, knowledge capabilities and experience (Ericsson et al. 1991; Hunt 2006; Norman et al. 2006; Yates et al. 2006). Furthermore, the effects of extended deliberate practice and the impact of deliberate learning of skills are more far-reaching than is commonly believed. Identifying appropriate knowledge capabilities and the years of experience that is required to attain expert performance, is a challenging task that require a thorough understanding of the problem domain and its stakeholders. Although some attributes of expert performance are generic, salient attributes of expert performance are largely context specific. Since the birth of comparing performance of experts and novices in social psychology (Chase et al. 1973; de Groot 1978), research on 'degree of proficiency' has played an important role in management and social science disciplines. Despite the long-standing cumulative tradition of research on degree of proficiency, Information System (IS) research has not identified criteria and possible determinants of high levels of proficiency.

Analyzing data gathered from 310 respondents from 27 organizations using a contemporary IS, this study attempts to: (1) identify the salient criteria that determine expert performance in contemporary IS and (2) to investigate the purported relationship between the years of experience and deliberate learning – i.e. training – with expert performance. Once the classification guidelines are established, we seek to classify IS-users according to their degree of proficiencies based on a popular three-level continuum. The study also demonstrates the mutual exclusivity of the three-level continuum and explores whether the classifications provide constructive management information for better management of IS. Various results will be compared against the standard hierarchy of employment.

The paper begins with a literature review primarily aimed at establishing the classification guidelines for degrees of proficiency. The study context is introduced next, followed by the details of the survey instrument that outlines the guidelines for determining degree of proficiency. The data analysis is reported next providing empirical evidence of that supports the new classification and its management utility. The paper concludes with a summary of key findings.

Degree of Proficiency and Experience

The primary objectives of this review of literature are; (1) to establish the importance of a classification that is based on the degree of proficiency for IS, (2) to identify the salient characteristics that helps to attain expert performance in IS domain, and (3) to explore the relationship between years of experience and the degrees of proficiency.

Degree of Proficiency

Degree of proficiency is generally associated with skills, expertise and knowledge, which extends over a continuum, from *novice → intermediate → expert*, where an 'expert' holds the highest degree of proficiency. Expertise is defined as superior performance in terms of success, swiftness, and/or accuracy. Experts have prolonged or intense experience through practice and education in a particular field and they are able to deal with new situations in their domain. (e.g. (Ericsson et al. 1994; Glaser et al. 1988; Leplat 1986; Schvaneveld et al. 1985). Moreover, an expert has recognized knowledge and expertise who can comment authoritatively on an issue and often is asked to give an opinion with regard to the specific facts (Bainbridge 1989; Olsen et al. 1989). Experts seem to have prolonged or intense experience through practice and education on their field of expertise. In contrast, a novice has only factual and free-context rules acquired from training and is typically at the early stage of the career (Dreyfus 1992; Ward et al. 2006). Lying between two extremes of an expert and a novice is an intermediate.

In order to develop a better understating of degree of proficiency, we sought explanations from Knowledge Management literature, where managing knowledge has been identified as a critical success factor for contemporary information system success (Bingi et al. 1999; Davenport 1996; Davenport 1998a; Davenport 1998b; Gable et al. 1998; Sumner 1999). Managing a contemporary IS is a knowledge intensive task that necessarily draws upon the experience of a wide range of people with diverse skills and knowledge capabilities (Gable et al. 2000; Soh et al. 2000). Demsetz (1991) and Grant (1996) suggest that knowledge acquisition and creation requires greater specialization than is needed for utilization. Hence the production of knowledge requires the coordinated efforts of individual specialists who process many different types of knowledge. Davenport (1998b) identifies three main related knowledge types for contemporary IS: (1) software-specific knowledge, (2) business process knowledge and

(3) organization-specific knowledge. Sedera (2004b) concluded that business process knowledge and organization-specific knowledge are similar and cannot be distinguished as separate entities.

Software specific knowledge refers to the knowledge, skills and expertise that those employees' posses in relation to the operation of the system they use. Business process knowledge refers to the in-depth understanding that an employees posses on, not just the functional area that s/he is involved in, but the entire business process that their functional area belong to. Organizations of the 'knowledge-era' focus on increasing effectiveness through establishing strong foundations in knowledge, which includes not only software knowledge but employees' knowledge of business processes and work practices. Akin to Xu et al., (2003), we argue that most (if not all) business processes are situational in nature, where the software is adapted to meet needs of specific business circumstances. In light of those finding, we argue that the two types of knowledge of the respondents is largely responsible for the degree of proficiency.

In general (regardless of the study context), 'training' has been identified as a critical aspect that contributes to employees' knowledge. Such formal training programs ensure wider distribution of highly context-specific knowledge that can be particularly useful throughout the phases of an IS lifecycle (Pan et al. 2005). In the interest of understanding the contribution of formal training on software and business knowledge, this study includes 'formal training' as an antecedent of overall knowledge.

Given that all organizations endeavour to move their information system users to the 'expert' end of the continuum to maximize efficiency and effectiveness, usually there is a mixture of expertise, varying from novice to expert, resulting from different rates of learning, attrition, new hires, and experience through usage. In exploring an approach to identify the degree of proficiency and its possible links with years of experience, we again looked into analogous literature in social science and psychology. Eriksson et al. (1994) suggest the statistical term *outlier* as a useful heuristic for identifying an expert. They suggest that usually, if a person is performing at least one or two standard deviations above the mean level in the population, that individual is said to be performing at an expert level. Elo (1986) makes similar observations in relation to Chess ratings where an expert is determined using two to three standard deviations above the mean. Similarly, a person is classified as a novice, if they perform below two standard deviations below the mean of the population.

Years of Experience

Moreover, we explore purported relationship between the 'years of experience' and the level of expertise. Social Science research on expert performance and expertise (Chi et al. 1988; Ericsson et al. 1991) has shown that important characteristics of experts' superior performance are acquired through experience arguing that exceptional performance is an outcome of the environmental circumstances, such as the duration and structure of activities[1]. Eriksson et al. (1993) hypothesized that the individuals' performances are a monotonic[2] function of the deliberate practice. They argued that the accumulated amount of deliberate practice and the level of performance an individual achieves at a given age is a function of the starting age for practice and the weekly amount of practice. A range of guidelines have been operationalized in various management disciplines to recognize degree of proficiency. IS research commonly employs 'years of experience' as a proxy measure for degree of proficiency and few IS studies with a delphi methodology employ 'self-reporting' experts (Brancheau et al. 1996; Chang et al. 2000). The view that merely engaging in a sufficient amount of practice, regardless of the structure of that practice, leads to maximal performance has a long and contested history and is demonstrated in series of classic studies of Morse code operators. Bryan et al. (1897) and Bryan et al. (1899) identified plateaus in skill acquisition, when for long periods subjects seemed unable to attain further improvements. However, they observed, with extended efforts, operators could restructure their skill to overcome plateaus. Keller (1958) later showed that these plateaus in Morse code reception were not an inevitable characteristic of skill acquisition, but could be avoided by different and better training methods.

Though it is tautological that 'years of experience' is related and at times influence the degree of proficiency, such a classification that is purely based on the years of experience for contemporary IS may lead to inconsistent interpretations, due to the involvement of many user cohorts (from senior managers to data-entry operators) each

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[1] Research demonstrates that some minimal biological attributes may also lead to the acquisition of expertise. This is considered beyond the scope of the study.

[2] Changing in one direction only; thus either strictly rising or strictly falling, but not reversing direction.

with a diverse set of skills and capabilities. Investigating the years of experience, researchers believe that it takes ten-years to become an expert from the time at which practice was initiated (Simon et al. 1973). Simon and Chase's (1973) "10-year rule" is supported by data from a wide range of domains: music (Sosniak 1985), mathematics (Gustin 1985), tennis (Monsaas 1985), and swimming (Kalinowski 1985).

Having established the salient characteristics and the criteria for identifying the degree of proficiency and the level of experience, figure 1 graphically depicts the relationship between the key variables. The solid line in figure 1 depicts the changes in degree of proficiency with the years of experience and the innate ability; where the dotted line demonstrates the likely higher levels of degree of proficiency based due to training, knowledge of the software and business process, the innate ability and the years of experience.

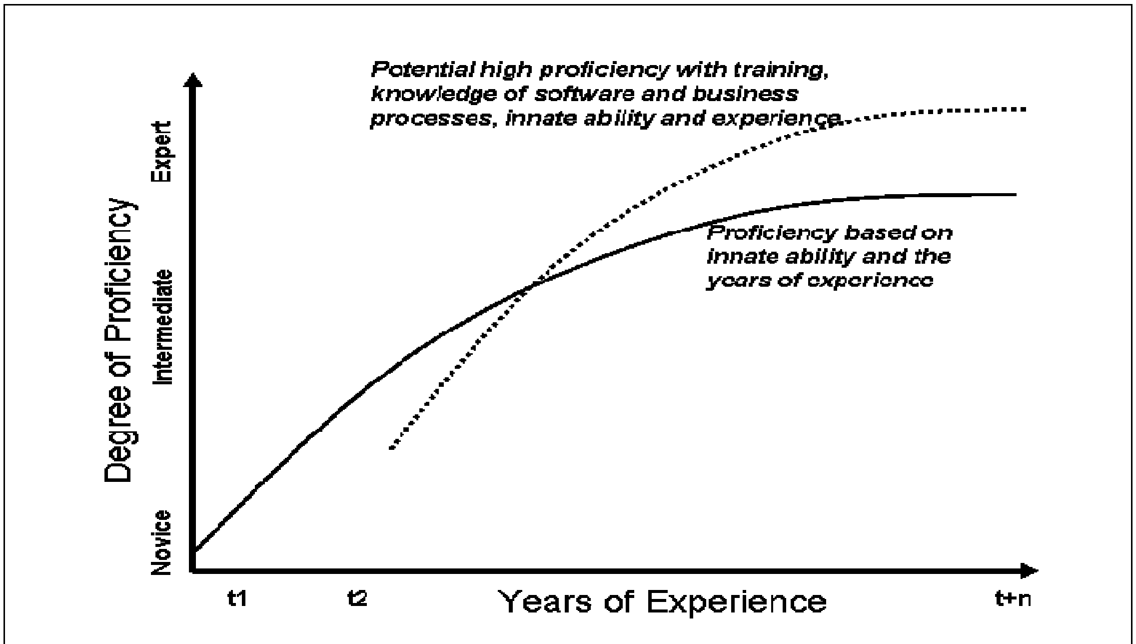

Figure 1: Relationship between the key variables

Study Context

The empirical data collection was conducted across 27 large state Government departments in Queensland, Australia that have implemented SAP in the second half of 1990s. Queensland State Government is the first public sector to implement SAP worldwide and it is also the first Australian state to implement a common financial management system state-wide. In 1995, the state Government of Queensland commenced implementation of SAP Financials across all state Government agencies (later followed by Controlling, Materials Management and in some agencies Human Resources). The Queensland Government approach was very much focused on using the Enterprise System as a common reporting and financial management tool (Queensland Treasury 2000a; Queensland Treasury 2000b). The objectives of the new SAP system was to provide an IS that would: (1) support the 'Managing for Outcomes' (MFO) framework and financial management improvement activities, (2) encourage best practice resource management across the Government departments, (3) facilitate consolidation of financial information across the departments, (4) meet the business needs of departments and (5) achieve economies of scale in main operations. The sample organizations provided an ideal study context, being relatively simple and homogenous – all being departments of the same State Government; all having implemented the same ES (SAP Financials); at around the same time; and all as at data collection having been operational for approximately 8 years; thus all were at a similar point in the ES lifecycle.

The study gathered details from all key-user-groups[3] of IS without a specifically resorting to a single user cohort. The key-user-groups of the study include: Strategic management, Management Operational staff, and Technical staff. Ideally, these key user groups would include representative response from the main groups of direct users of the IS – those users who access the system directly, or who use its direct outputs. Though these key user groups can vary with type of system (see discussion in Anthony (1965), Cameron and Whetten (1983), Seddon et al. (1999)), for IS that are largely intra-organizational (e.g., Financials) the cohorts are typically those identified (Sedera et al. 2006).

The Survey Instrument

The survey instrument[4] comprised of three main sections. The first section gathered demographic data that enable the classification of respondents according to the traditional hierarchy of employment. It asked respondents provide the employment title (e.g. Director, Business Analyst, ABAP developer) and a brief description of their involvement with the SAP system. Section two included four items to determine the degree of proficiency. The items were designed to assess their software specific knowledge, business process knowledge, formal training and the overall knowledge. Section three of the instrument included two questions to determine the level of experience where the respondent was requested to provide the years of service at the current organization and years of service with public sector. The last section (section four) of the instrument included questions to evaluate their overall experience. The 27 questions in section four were adopted from the IS-Impact measurement model (Gable et al. 2003; Gable et al. 2008; Sedera et al. 2004a) and evaluated respondent's experience in relation to System Quality, Information Quality, Individual Impact and Organizational Impact. Not having items co-located in the instrument minimized the biasness from common method variance. All survey items were scored on a seven-point Likert scale with the end values (1) 'Strongly disagree' and (7) 'Strongly Agree', and the middle value (4) 'Neutral'. All other questions, for example the years of service, were completed in free-text fields.

Respondent Classification

The survey received a total of 319 responses representing the 27 organizations. Nine responses were removed from the data analysis due to missing data and for perceived frivolity, leaving 310 valid responses for further data analysis.

Based on their employment title and the survey information provided pertaining to their involvement with the SAP system, respondents were first categorized according to four hierarchies of employment (i.e. Strategic, Management, Operational and Technical). In order to minimize individual errors of judgment, three academics and two senior business analysts from surveyed organizations, participated in the classification of respondents. Participants individually mapped a sample of respondents into the four classifications and compared results. Guidelines were designed to increase the systemisation, repeatability and the validity of the process[5]. Comparison of the individual classifications revealed an average inter-coder agreement of 80%[6] (Krippendorff 1980). The classification exercise categorised (See table 1) 11% of respondents were from the Strategic level, 39% from Management level, 35% were from the Operational levels and 15% represented Technical staff. All indications suggest that this distribution is representative of users of the SAP system in Queensland Government.

Table 1: Classification of Respondents – Hierarchy of Employment

Hierarchy	#	%
Strategic	35	11%
Management	122	39%
Operational Staff	108	35%
Technical Staff	45	15%
Total	**310**	**100%**

[3] "Key users" does not include such groups as shareholders, debt holders or others who may indirectly have a vested interest in the impact of the IS, but who are not direct users of the system or its outputs (Note that such things as annual reports for shareholders and marketing material, are highly processed outside the IS and are distant from any IS that may have originated certain of their details).
[4] The full survey instrument is available upon request.
[5] Classification guidelines and samples are available upon request.
[6] Krippendorf (1980) recommends inter-coder reliability of at least 70% and suggests that any significant discrepancies should be discussed until consensus on the mappings is reached.

The 'degree of proficiency', was next established employing the guidelines of Ericson and Charness (1994) and Elo (1986) using inferences from outliers and standard deviations of the items described in part two of the instrument. Following guidelines, we first combined all items and established the mean and standard deviation for the entire sample for items on software knowledge and business process knowledge. The mean of the sample was 4.01 and the standard deviation was 1.001. Drawing the cut-offs for the mean values for expert, novice and intermediate classifications, an expert was considered to have mean value of 6 (or above) and respondents with a mean value of 2 (or below) were considered a novice. This classification revealed 12% of experts, 77% of intermediates and 11% of novices (see table 2).

Table 2: Classification of Respondents – Degree of Proficiency

Degree of proficiency	#	%
Expert	36	12%
Intermediate	240	77%
Novice	33	11%
Total	**310**	**100%**

Moreover, cross referencing details of table 1 and 2, table 3 demonstrates the degree of proficiency within each standard hierarchy of employment. From table 3 it is revealed, that contrary to the popular assumption that most strategic staff are experts, the analysis below shows that each hierarchy of employment has a similar percentage distribution of the three degrees of proficiencies. Observing individual compositions of degrees of proficiency within each hierarchy, it is evident that the strategic cohort in fact has the lowest percentage of experts, compared to the management cohort which has the highest percentage of experts.

Table 3: cross referencing the degrees of proficiency and hierarchy of employment

Cohort	Classification	#	%
	Novice	9	8.33%
Operational	Intermediate	88	81.48%
Total = 108	Expert	11	10.19%
	Novice	15	12.30%
Management	Intermediate	89	72.95%
Total = 122	Expert	18	14.75%
	Novice	3	8.57%
Strategic	Intermediate	29	82.86%
Total = 35	Expert	3	8.57%
	Novice	7	15.56%
Technical	Intermediate	34	75.56%
Total = 45	Expert	4	8.89%

The Data Analysis

The data analysis reported herein has five key analyses related to the objectives of this research. First, the analysis depicts that the three degrees of proficiencies hold significantly different views on their overall experience with the system. Investigating the observed differences further, the second data analysis reports the descriptive statistics of the four dimensions of positive experience. Third, we investigate the relationship between the degree of proficiency and the years of service, both within the sector and within the same organization. Next, the data analysis looks at establishing the impact of formal training on the degree of proficiency. The analysis concludes with a consolidated path model that brings together all key premises of this research.

Assessing Differences in Degree of Proficiency

Using paired t-test, we first assess whether the degrees of proficiency demonstrate differences in opinions with regards to the dimensions of positive experience. Using results in table 4, it evident that all pairs demonstrate significant differences on four dimensions of positive experience. The differences observed in table 4 provide additional evidences of the validity and the existence of the degree of proficiency classification. Furthermore, we argue that, to the extent to which the classifications demonstrate significant differences with each other (e.g. experts vs. novices OR strategic vs. operational) evidences the importance of considering the degree of proficiency[7].

Table 4: T-test of Degree of Proficiency

	SQ			IQ			II			OI		
	t value	df	Sig (2-tailed)	t value	df	Sig (2-tailed)	t value	Df	Sig (2-tailed)	t value	df	Sig (2-tailed)
Expert / **Novice**	-5.59	68	**0**	-6.37	68	**0**	-3.45	68	**0.001**	-6.44	68	**0**
Expert / **Intermediate**	-4	272	**0**	-4.52	272	**0**	-1.44	272	0.158	-4.38	272	**0**
Novice / **Intermediate**	-4.38	274	**0**	-4.06	274	**0**	-3.44	274	**0**	-4.12	274	**0**

SQ = System Quality, IQ = Information Quality, II = Individual Impact, OI = Organizational Impact

Descriptive Statistics for Degree of Proficiency

Figure 2 depicts the mean scores of the four dimensions where respondents' positive experience is recorded corresponding to the three degrees of proficiency. The evidence clearly shows that the mean scores of all dimensions ascend with the increasing degree of proficiency, where experts demonstrate the highest mean scores and novices displaying the lowest. The descriptive results below further strengthen the credibility of the method employed to classify respondents according to the degrees of proficiencies.

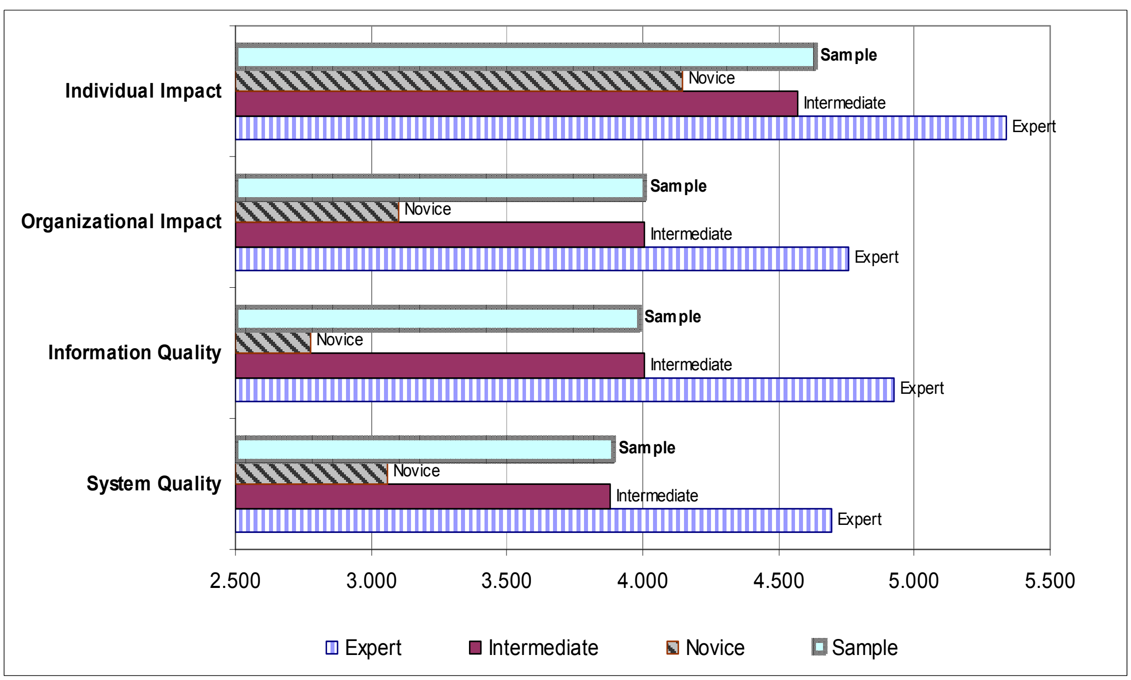

Figure 2: Descriptive Statistics for degree of proficiency

[7] Similarly, if we did not observe any differences, then there is no sound basis to classify respondents in that manner for management purposes.

Experience Required for Attainment of Expert Performance

The section below tests the purported relationship between the years of experience and the degree of proficiency. To investigate whether the possible influence of 'years of experience', we graph the relationship between the "years spent with public sector" and "years with the current agency" with the degree of proficiency. Results depicted in figure 3 it is clear that there exists a linear relationship the degree of proficiency and "the number of years of service with their department". The linear relationship observed herein provides empirical evidence to the claims in literature such that of (Ericson et al. 1993). However, this study fails to identify a relationship between the years of total experience (measured through the "number of years in public sector") and the degree of proficiency, perhaps suggesting the need of a more specific knowledge (similar to business process knowledge) in the context of Enterprise Systems.

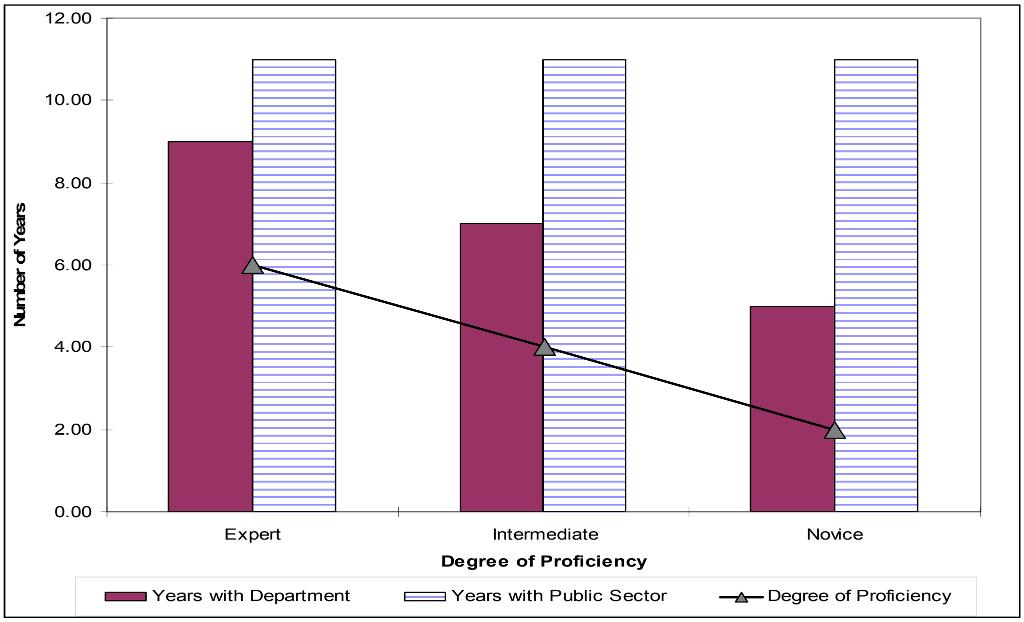

Figure 3: Experience (# of years) and the Degree of Proficiency

More importantly, the above analysis demonstrates that high levels of proficiency in a given domain can be eventually attained as a function of extended experience. Consistent with literature, the findings of figure 3 empirically support Simon and Chase's (1973) "10-year rule", where the expert performance takes at least 10 years of intense prior preparation in the given context (number of years with Department). Adding further, the findings emphasize, that despite the similarities in public sector organizations in general in governance and structure, the "number of years in public sector" seems to have a lesser impact on the higher degree of proficiency, where the number of years with public sector remains constant with all three degrees of proficiency.

In addition to the years of experience, the level of proficiency can be increased with deliberate efforts of improvements. The stable levels of performance, after extended experience, are not rigidly limited by unmodifiable, possibly innate, factors, but can be further increased by deliberate efforts. The discussion below highlights one such example of a popular deliberate effort to increase degree of proficiency.

Training Requirements for Attainment of Expert Performance

Provision of 'formal training' is one the widespread deliberate ways of increasing degree of proficiency in contemporary IS. In highly context-specific contemporary IS, especially to ensure wider dissemination of appropriate knowledge, formal training programs are frequently employed. Formal training is particularly effective and important with the introduction and operation of large and complex systems like Enterprise System (Pan et al. 2005). In order to determine the relationship between formal training and its contribution to the overall knowledge of the three types of proficiencies, a correlation analysis is conducted.

Table 5: Relationship between Training and Knowledge			
	Overall Knowledge		
	Novice	Intermediate	Expert
Formal Training	0.703	0.765	.556

Results in table 5 demonstrate a strong and significant correlation between formal training and overall knowledge for all three cohorts, where intermediate cohort demonstrating the strongest correlation. A possible interpretation is that the training programs in the sample organizations are better aligned with the needs of intermediate and novice cohorts. Many organizations derive a training plan that caters to the majority to attain economy-of-scale. An alternative views that arises from psychology is that the experts do not have a high reliance on formal training programs, instead overall knowledge of an expert is developed over a period of time with experience and practice.

The Consolidated Model for Degree of Proficiency

Having established criteria for establishing degree of proficiency and having demonstrated the importance of formal training, we now demonstrate the relationship between (1) formal training, (2) overall software knowledge held by the employees and (3) the overall positive experience for each cohort when using the system. The overall positive experience is determined each cohorts' satisfaction on the: (i) Quality of the System, (ii) Quality of Information, (iii) Individual Impact and (iv) the Organizational Impacts received. Using the aforementioned constructs, it is hypothesized that *higher degrees of proficiency leads to a positive experience with the system*.

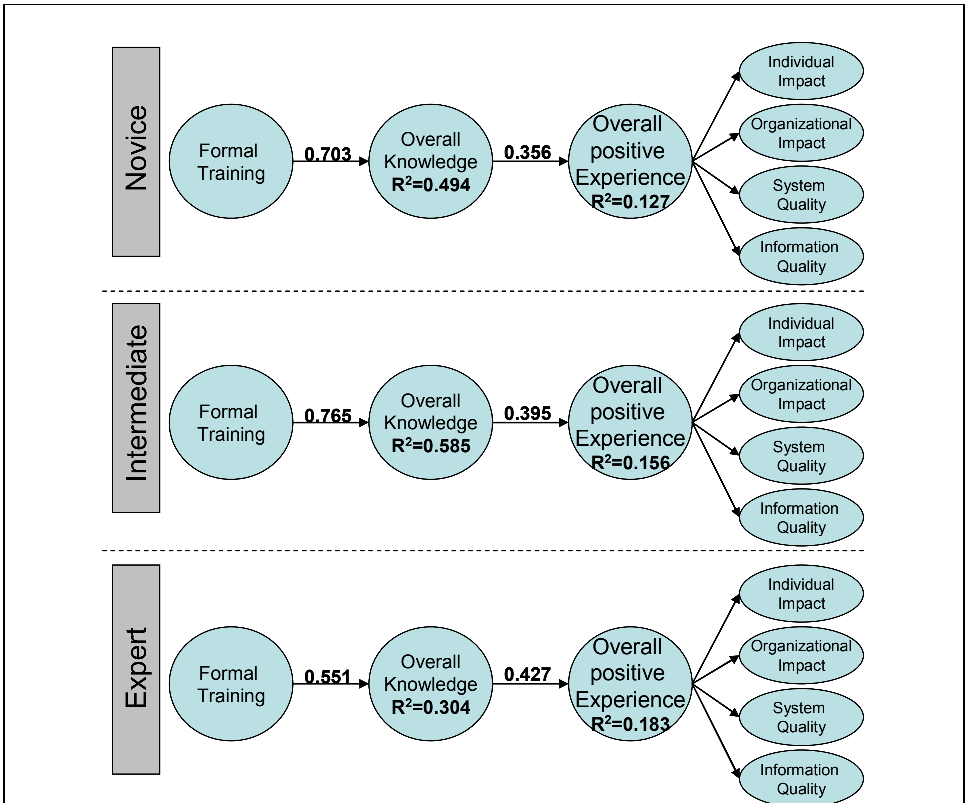

Figure 4: A consolidated path model for degrees of proficiency

A path model using (PLS) procedure (Wold 1989), and employing the SmartPLS software (Ringle 2005) to test the three constructs. It is noted that the model above (figure 4) is a linear representation (reduction) of the complex, dynamic and iterative process, in which the proficiency groups, the structures (i.e. training), and the system interact to change (produce and reproduce) socio-technical systems that evolve continually. The potential limitations from measuring a complex socio-technical construct as a linear relationship are acknowledged. Nonetheless, it is believed that any attempt at operationalization and quantification necessitates simplification.

Results of the path model analysis suggest that, the strength of the paths between knowledge and positive experience (and the r^2 on the dependent variable) is in the ascending order of the degree of proficiency (Lowest for the novices, followed by intermediates and the experts). The results suggest that an expert with high software knowledge and business process knowledge has the capacity to better utilize the system thus attaining a highly positive experience when interacting with the system.

Though the initial results of this study results are heartening, the study has several limitations. First, the data analyzed was gathered only from public sector organizations using a single type of Enterprise System application (i.e. SAP), which could affect the generalizability of the findings. Second, operationalization of the overall knowledge construct is restricted in the current study, being based solely on the two types of knowledge. The construct can be enhanced by using additional measures in future research. The conceptualization of knowledge transfer is limited to formal knowledge transfer methods. Though the literature suggests that with large complex systems, formal transfer is more effective than informal transfer, we recognize the limitation of not considering informal knowledge transfer methods. The cross-sectional nature of the study is a further limitation, which might be addressed in future through a longitudinal design. We also acknowledge possible limitations of the uni-directional effects of both the formal training and overall knowledge on the overall positive experience of the study – ignoring recursivity.

Conclusions

This paper introduced the notion of expert performance for Information Systems research, where the expert performance is based on, not on the innate abilities, but on the skills, knowledge and experience. Using a contemporary Information Systems context, gathering data from 310 respondents, the study empirically demonstrated the relevance of employing (1) business process knowledge, and (2) software specific knowledge to determine the expert performance. In relation to four dimensions of system performance, the research findings revealed that the experts attain the highest level of performance compared to their other counterparts. IS researchers could employ the degree of proficiency guidelines to classify respondents on a continuum in future data analyses. It is highlighted that such a meaningful stakeholder classification would enable researchers to supplement the traditional hierarchy of employment. The consolidated model demonstrated that the experts are more likely to have a positive experience with the system than other degrees of proficiencies. From a practical view-point, organizations could now use the classification guidelines to evaluate the degree of proficiency and facilitate employees to attain expert performance through the two types of knowledge. Moreover, having established a relationship between formal training and expert performance, this research confirms the importance of formal training programs.

Furthermore, the study also empirically demonstrated the purported relationship between the years of experience and the degree of proficiency. In agreement with Ericson, Krampe and Tesch-Romer (1993) the study found that individual degrees of proficiency has a linear relationship with the number of years that a respondent stays within an organization confirming that performance is a monotonic function of deliberate practice. However, this study did not find a relationship between the degree of proficiency and the total number of years a respondent remained in the industry sector.

From a system evaluation viewpoint, the empirical evidence alludes to the danger of treating multiple stakeholders as a single dataset. The three level degree of proficiency can now be employed as a meaningful classification that supplements the standard hierarchy of employment. From a change management view point (including implementation, upgrades, training and process optimisation exercises), using the knowledge of the business process and the knowledge of the software allows organizations to classify respondents into three meaningful alternative classifications can be quite useful. Depending on the percentages of experts, intermediaries and the novices in each hierarchical cohort, it is conceivable organizations to devise change management plans. Similar to views of in management science, the expert staff in each hierarchical group could act as the conduits in change management initiatives.

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